TED (10)–4029 Reg. No. .....

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SIXTH SEMESTER DIPLOMA EXAMINATION IN MECHANICAL ENGINEERING—OCTOBER, 2013

REFRIGERATION AND AIR CONDITIONING

[*Time* : 3 hours

(Maximum marks : 100)

[*Note*: 1. Use of psychrometric chart allowed.
2. Missing data if any may be suitably assumed.]

Marks

PART—A

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Define sensible heat of a substance.
2. What is meant by open air refrigeration cycle ?
3. Write the classification of rotary compressors.
4. Show the humidification process on a psychrometric chart.
5. List the factors considered in heating - load calculation. (5×2=10)

PART—B

II Answer *any five* questions. Each question carries 6 marks.

1. Explain the units of refrigeration.
2. How the refrigerants are classified ?
3. What is an expansion device and what is its purpose in a refrigeration system ?
4. Write short notes on dry air and moist air.
5. Explain with the help of psychrometric charts, sensible cooling process and efficiency of cooling coil.
6. Explain with neat sketch the working of summer air conditioning system.
7. Explain the conditions that affect body heat. (5×6=30)

PART—C

(Answer *one* full question from each unit. Each question carries 15 marks.)

UNIT – I

III (a) List the types of vapour compression cycles. 4

(b) Mention the advantages and disadvantages of vapour compression refrigeration system over air refrigeration system. 6

(c) 1.5 kW per ton of refrigeration is required to maintain the temperature of –40°C in the refrigerator. If the refrigerant cycle works on Carnot cycle, determine COP of the cycle and temperature of the sink. 5

OR

Marks

IV (a) Explain with a block diagram vapour compression system of refrigeration. 5

(b) Find the theoretical COP for a CO_2 machine working between the temperature range of 25°C and –5°C. The dryness fraction of CO_2 gas during the suction stroke is 0.6.

Following properties of CO_2 are given :

Temperature °C	Liquid		Vapour		Latent heat kJ/kg
	Enthalpy kJ/kg	Entropy kJ/kg	Enthalpy kJ/kg	Entropy kJ/kg	
25	81.23	0.2512	202.65	0.6927	121.42
–5	–7.54	–0.0419	236.98	0.8416	245.36

10

UNIT – II

V (a) How are condensers classified ? 4

(b) Draw a neat sketch of cold storage. 6

(c) What are the desirable properties of an ideal refrigerant ? 5

OR

VI (a) Explain with block diagram vapour absorption system of refrigeration. 8

(b) Explain the main stages for the process of freeze drying. 7

UNIT – III

VII (a) State Dalton's law of partial pressure. 5

(b) For a sample of air having 22°C DBT, relative humidity 30% at barometric pressure of 760 mm of Hg. Using psychrometric chart find the humidity ratio and vapour density. 10

OR

VIII (a) List the factors depends upon the by-pass factor. 5

(b) 200 m^3 of air per minute is passed through the adiabatic humidifier. The condition of air at inlet is 40°C DBT and 15% relative humidity and the outlet condition is 25°C DBT and 20°C WBT. Find the DPT and the amount of water vapour added to the air per minute. 10

UNIT – IV

IX (a) Write short notes on window type air conditioner. 4

(b) What are the sources of sensible heat gain and latent heat gain ? 6

(c) Draw a neat labeled diagram of an year round air conditioning system. 5

OR

Marks

X (a) Sketch a neat layout of central air conditioning plant. 5

(b) The following data refer to design of an air conditioning system of a hotel :

Number of dining people = 30

Employees serving the food = 3

Outdoor conditions = 35°C DBT and 25°C WBT

Required comfort condition = 26°C DBT and 50% RH

Sensible heat gain per person taking food = 210 kJ

Latent heat gain per person taking food = 168 kJ

Sensible heat gain per person serving food = 210 kJ

Latent heat gain per person serving food = 270 kJ

Sensible heat gain per meal = 12.5 kJ

Latent heat gain per meal = 20 kJ

Sensible heat gain due to radiation = 6700 kJ/hour

Total heat flow through walls, roof and floor = 20000 kJ/hour

Equipment sensible heat gain = 8500 kJ/hour

Equipment latent heat gain = 2000 kJ/hour

Total infiltrated air = 360 m^3/hour.

Calculate :

(i) Total room heat load; and

(ii) Room sensible heat factor. 10